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Supporting Computing Educators to Create a Cycle of Teaching and Computing Education Research

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ABSTRACT

Despite a rich history of computing education in the United Kingdom and Ireland, computing educators often rely on the same procedures and teaching practices rather than embrace innovations. Similarly, while a growing collection of literature exists on educational theory and practice in computing education, much of this focuses on the same concepts and concerns. An aspiration is that both these problems can be simultaneously addressed by computing educators adopting a cycle of embracing existing literature when devising teaching practice and then feeding their experience and findings back to the community in a rigorous fashion. Consequently, this panel supports computing educators by acting as advisers on a one-on-one basis to support audience members in discovering or devising their own cycle of teaching practice and computing education research.

CCS CONCEPTS

• **Social and professional topics** → *Computing education*.

KEYWORDS

computing science, computing science education

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1 SUMMARY

There is a rich and varied history of computing science education in the United Kingdom and Ireland [2]. Early interest in the potential for computing science is evident in terms of investment in projects, such as the BBC Micro, by various governments that have ensured an early base in computing education [1]. However,

despite decades of interest and teaching of computing, both in the United Kingdom and Ireland but also around the world, computing educators continually utilise the same practices and approaches. Lectures as a teaching practice are as popular today as they have ever been, despite a wealth of different practices and approaches for educators to choose from [6].

Consequently, there is an increasing collection of research in terms of motivating the use of educational innovations by computing educators [10]. Nevertheless, it is still not fully understood why computing educators favour some teaching practices over others [8]. The reasons why computing educators persist or desist with specific pedagogical practices is complex, but often strong student performance is sufficient motivation for educators to continue using a teaching practice [5]. However, computing educators making distinct and not repeated use of teaching practices will generally lead to poorer results as learners have insufficient experience with such practices when compared to more established methods [7].

Computing educators should make use of the growing body of literature not only to utilise successful teaching practices but also to ensure the practices have meaningful benefit for learners. However, while many different theories can underpin computing education, a few are the focus of many computing educators and these are in areas such as student attitudes, misconceptions and learning styles [9]. While there is a long history of debating what computing educators should know when embarking on computing education [4], the challenge for educators is to continually refresh teaching practice where appropriate and share experience of applying practice with others.

Computing educators need to discover or devise a personal cycle, embracing the body of literature on computing education but also contributing back to that same literature. The specific structure of that cycle will depend on the individual computing educator, as context is incredibly important [3].

Consequently, this panel brings together a diverse group of computing educators to not only consider, reflect and share their own personal cycles, but also to support others in discovering or devising their own. The aim of the panel is to act as individual advisers to interested audience members in discovering and devising their cycle.

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2 PANEL STRUCTURE

The panel session follows the conference Keynote on the same topic. The panel session will begin by introducing the panel members and asking them to briefly outline their context and reflection on their own cycle of teaching and computing education research. The panel members will then be allocated to individual virtual spaces using the conference platform and attendees will be advised to join the room of the panelist they are interested in engaging with about their cycle. Attendees will be advised that working with the panelist may be one-on-one or in groups depending on demand. The session will then conclude with the panel reconvening and sharing some of their thoughts on the experience of the session.

3 NEIL C. C. BROWN

Neil Brown is a Research Fellow in the Department of Informatics at King's College London. His research centres around tools for helping novices learn to program. He is involved in the development of the Integrated Development Environments (IDEs), BlueJ and Greenfoot, which are aimed at helping novices learn to program in Java. He was heavily involved with the development of Stride, a frame-based programming editing interface that aims to combine the best of blocks- and text-based editing. He is also in charge of the Blackbox project, which collects large-scale programming activity data from users of BlueJ. He has been publishing in computing education for over ten years.

4 QUINTIN CUTTS

Quintin Cutts is Professor of Computer Science Education within the School of Computing Science at the University of Glasgow. Director of the Centre for Computing Science Education with 18 affiliated staff and research candidates that operate at the nexus of the College of Science and Engineering and College of Social Sciences within the University of Glasgow. His research centres on computer science education, with further interest in the use of technology to enhance face-to-face teaching and learning environments. He is involved in the development of school curricula for computer science, having contributed to the new Curriculum for Excellence in Scotland, as well as initiatives further afield in England and internationally. He has received awards for learning and teaching excellence, and is committed to engaging students deeply with their studies at all levels, drawing on his own and other research into psychological aspects of learning and technology in education. He is on the Academic Board advising on and assisting with the work of National Centre for Computing Education, set up by the UK Government with funding of £84M, and on the board of the United Kingdom ACM Special Interest Group in Computer Science Education. In 2015, he was awarded an MBE for services to computer science.

5 MARIA KALLIA

Maria Kallia is a Research Associate within the school of Computing Science (Centre for Computing Science Education) at the University of Glasgow. She obtained her PhD at the School of Education at King's College London. During her PhD, she investigated threshold concepts, misconceptions, and the affective domain in computer programming at the secondary school level. Maria has also worked

as a computer science teacher for six years in Greece. Her previous studies include a Master in Education at the University of Roehampton, Master in Information Systems, and BSc in Informatics at Athens University of Economics and Business.

6 JOSEPH MAGUIRE

Joseph Maguire is an Associate Professor in Computing Science within the School of Computing Science at the University of Glasgow working at the intersection of security, privacy and education. Member of the Centre for Computing Science Education and previously visiting researcher at the Centre of Advanced Security Research in the Technische Universität Darmstadt. He is interested in the theory and application of computing systems as well as their impact on individuals and society in terms of security, privacy and education. He has made contributions to several leading national and international venues, both in security and education, including CEP, LASER, UKICER, ICER, STAST, CHI as well as EuroS&P. He is committed to supporting colleagues and students in achieving their best work, having served as General and Programme Chair for the United Kingdom and Ireland Computing Education Research (UKICER) conference, leader of the Engaging and Active Security Education (EASE) workshop, active board member of the United Kingdom ACM Special Interest Group in Computer Science Education as well as providing sustained academic service to a number of leading venues.

7 FIONA MCNEILL

Fiona McNeill is a Reader in Computing Education at the University of Edinburgh. Her main research interests are in access to and experience of computing education at all levels. She also does research in automated data matching and integration, particularly focussed on data sharing and communication during crisis management. She is very engaged with supporting women in CS and STEM and in CS outreach. She is a fellow of the British Computer Society (BCS), co-chairs the BCS Scottish Computing Education Committee (SCEC), represents the BCS on the Royal Society of Edinburgh's Learned Societies' Group and is a board member of the BCS Academy. She is highly engaged with learning and teaching, and in 2020 won the Principal's Award for Outstanding Contribution for her support of first year students.

8 LEO PORTER

Leo Porter is an Associate Teaching Professor in the CSE Department at UC San Diego. His research interests include Peer Instruction (PI), predicting student outcomes, faculty adoption, and concept inventories. He's known for his work studying the PI pedagogy and for his recent work developing a Concept Inventory for Basic Data Structures. Dedicated to helping faculty adopt best practices in teaching, he co-founded the annual "New Computer Science Faculty Teaching Workshop." He has received five Best Paper Awards and SIGCSE's 50th Year Anniversary Top Ten Symposium Papers of All Time Award.

REFERENCES

- [1] Neil C. C. Brown, Sue Sentance, Tom Crick, and Simon Humphreys. 2014. Restart: The resurgence of computer science in UK schools. *ACM Transactions on Computing Education (TOCE)* 14, 2 (2014), 1–22.

- [2] Stephen Doyle. 1985. *GCSE Computer Studies for You*. Nelson Thornes.
- [3] Sally Fincher and Josh Tenenberg. 2006. Using theory to inform capacity-building: Bootstrapping communities of practice in computer science education research. *Journal of Engineering Education* 95, 4 (2006), 265–277.
- [4] Judith Gal-Ezer and David Harel. 1998. What (else) should CS educators know? *Commun. ACM* 41, 9 (1998), 77–84.
- [5] Christopher Lynnly Hovey and Lecia Barker. 2020. Faculty Adoption of CS Education Innovations: Exploring Continued Use. In *Proceedings of the 51st ACM Technical Symposium on Computer Science Education*. 570–576.
- [6] Christopher Lynnly Hovey, Lecia Barker, and Margaret Luebs. 2019. Frequency of instructor-And student-centered teaching practices in introductory CS courses. In *Proceedings of the 50th ACM Technical Symposium on Computer Science Education*. 599–605.
- [7] Joseph Maguire, Susan Stuart, and Steve Draper. 2008. Student generated podcasts: Learning to cascade rather than create. *Learners in the Co-creation of Knowledge* (2008), 67.
- [8] Lijun Ni. 2009. What makes CS teachers change? Factors influencing CS teachers' adoption of curriculum innovations. *ACM SIGCSE Bulletin* 41, 1 (2009), 544–548.
- [9] Claudia Szabo, Nickolas Falkner, Andrew Petersen, Heather Bort, Kathryn Cunningham, Peter Donaldson, Arto Hellas, James Robinson, and Judy Sheard. 2019. Review and use of learning theories within computer science education research: primer for researchers and practitioners. In *Proceedings of the Working Group Reports on Innovation and Technology in Computer Science Education*. 89–109.
- [10] Cynthia Taylor, Jaime Spacco, David P Bunde, Zack Butler, Heather Bort, Christopher Lynnly Hovey, Francesco Maiorana, and Thomas Zeume. 2018. Propagating the adoption of CS educational innovations. In *Proceedings Companion of the 23rd Annual ACM Conference on Innovation and Technology in Computer Science Education*. 217–235.